Natural and Cultural Resources Management Plan

and

Environmental Assessment

TUMACACORI

National Monument Arizona

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CULTURAL AND NATURAL RESOURCES

MANAGEMENT PLAN

AND ENVIRONMENTAL ASSESSMENT

TUMACACORI NATIONAL MONUMENT

Arizona

Prepared by

Tumacacori National Monument
National Park Service
Department of the Interior

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ENVIRONMENTAL SUMMARY

This Natural and Cultural Resources Management Plan for Tumacacori National Monument combines research and management projects to aid in perpetuating and interpreting the monument's natural and cultural resources for the enjoyment of present and future generations. The plan concerns preservation, vegetation, wildlife and cultural research.

Proposed Actions. Cultural resource proposals include: archeological research, ruins stabilization of the mission complex and research studies concerning historical agriculture, communications, trade and social structure. Natural resource proposals include: a plant inventory and vegetation map to aid in elimination of exotic species and preservation of the monument ruins, animal control program to prevent further damage to the archeological ruins and vegetation maintenance to protect subsurface ruins and aid in preservation.

Impacts. Overall impacts of the plan actions will be preservation of the cultural and natural conditions of the mission period and prevention of further environmental deterioration. The program will assure preservation of the monument ruins, but efforts may at times mask or replace the original historic fabric with more modern structural materials. Short-term uses that may interfere with long-term productivity are not proposed.

Alternatives. No action was considered for each proposed action. This would perpetuate present conditions and in many instances, continue trends towards resource loss. Complete historical restoration of the mission complex was another alternative considered. This action, however, would be counter to Tumacacori's establishment act, to protect the mission ruins, and also counter to National Park Service directives emphasing preservation.

Conclusion. Because none of the proposed actions entail significant environmental impacts, it is recommended that the Natural Resources Management Plan for Tumacacori National Monument be assigned

a negative declaration. Unless significant controversy develops during public review, a full environmental statement will not be prepared. The resources management planning effort at Tumacacori National Monument will then be translated into an action program when the 30-day public review plan has expired.

11-1-76	Joseph L. Sewell
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11/2/76	John V. Cary
Date	General Superintendent, Southern Arizona Group
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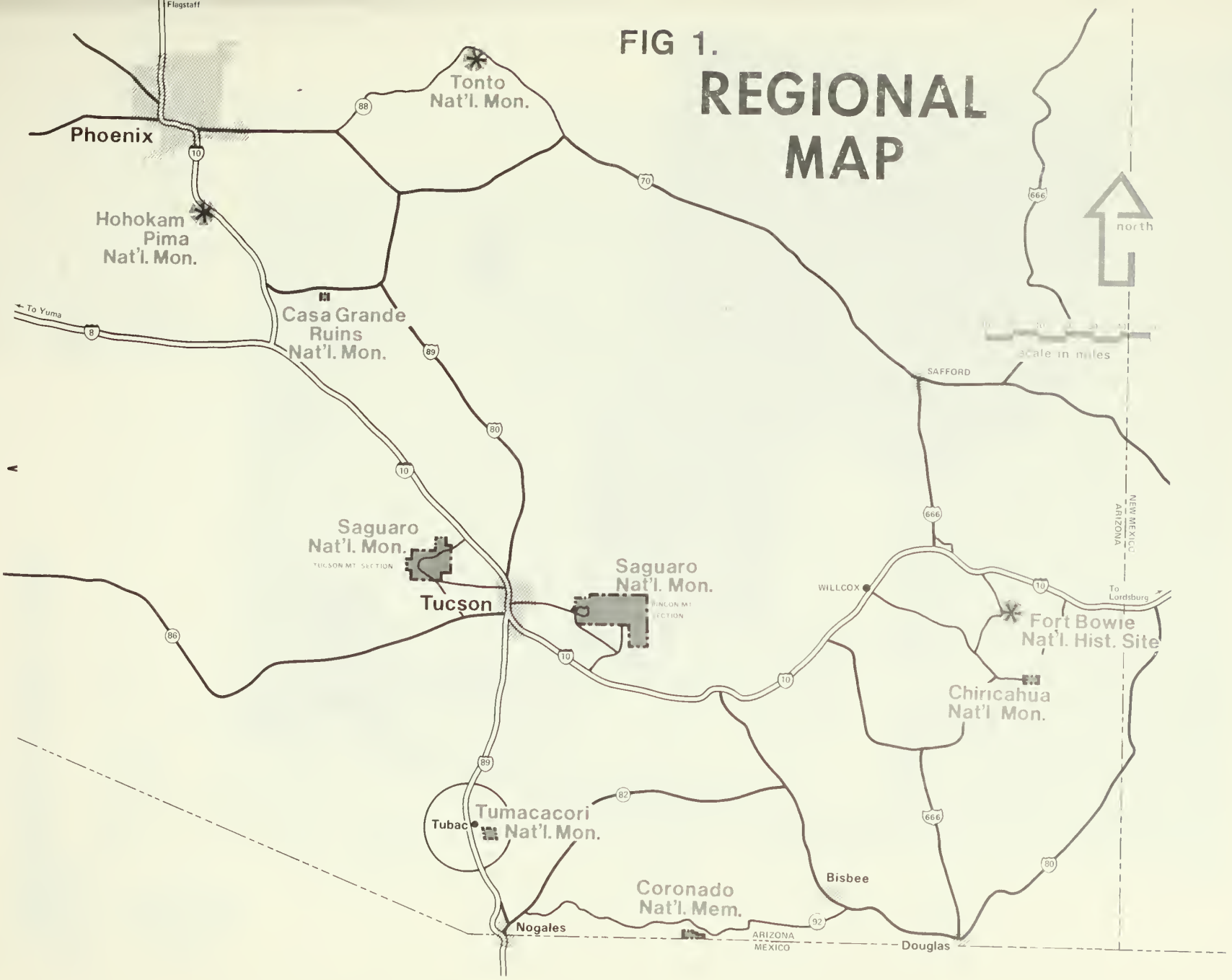
FIG 1.
REGIONAL MAP
Flagstaff
Phoenix
Tonto Nat'l. Mon.
Hohokam Pima Nat'l. Mon.
Casa Grande Ruins Nat'l. Mon.
To Yuma
Saguaro Nat'l. Mon.
TUCSON MT. SECTION
Tucson
Saguaro Nat'l. Mon.
RINCON MT. SECTION
Tumacacori Nat'l. Mon.
Tubac
Nogales
Coronado Nat'l. Mem.
ARIZONA
MEXICO
Douglas
Bisbee
WILLCOX
SAFFORD
Fort Bowie Nat'l. Hist. Site
Chiricahua Nat'l Mon.
To Lordsburg
NEW MEXICO
ARIZONA
north
scale in miles

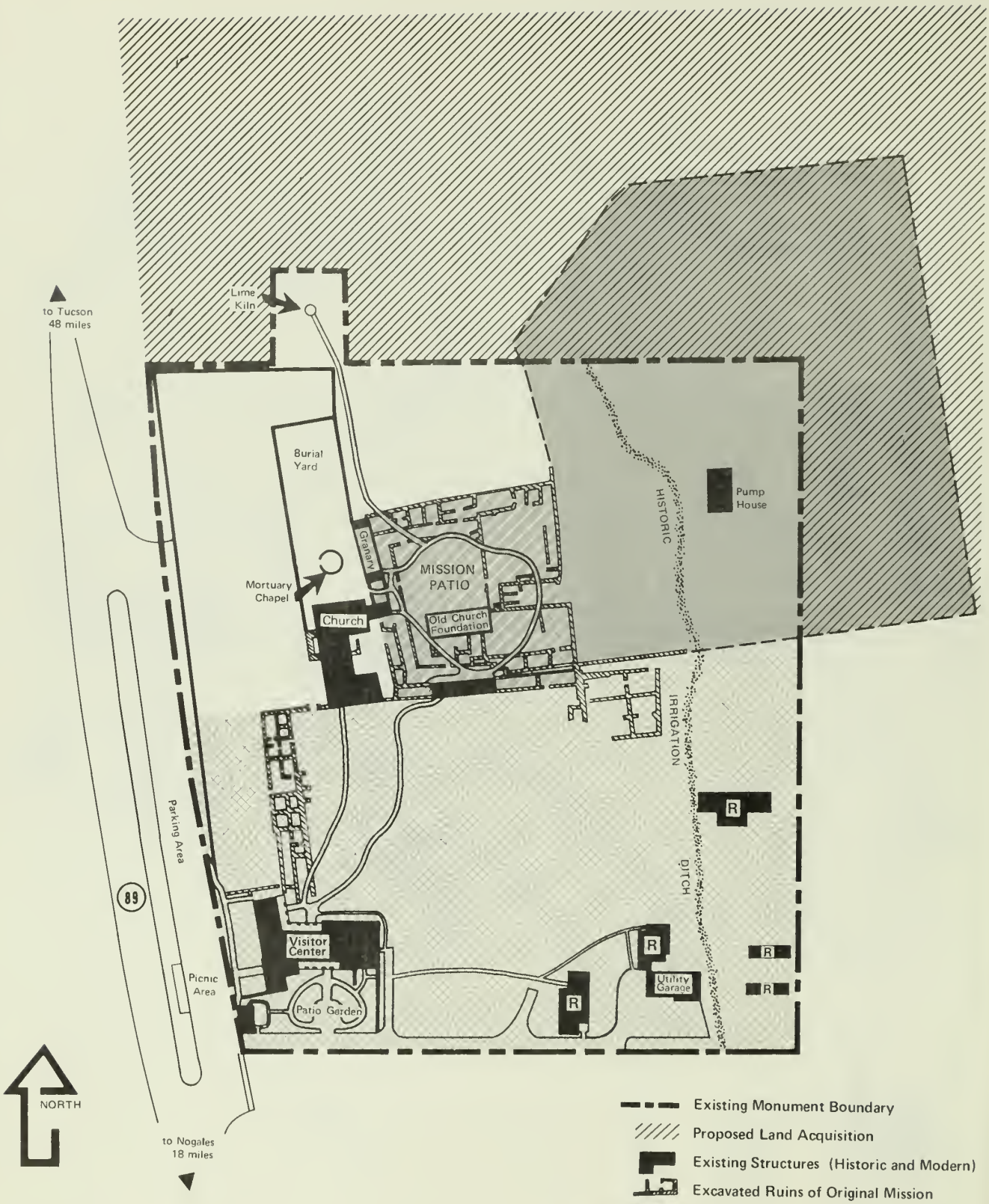

Fig 2.
Tumacacori Nat'l. Mon.

RESOURCES MANAGEMENT PLAN

INTRODUCTION

This resources management plan presents a method for the National Park Service to manage the cultural and natural resources of Tumacacori National Monument. The plan identifies resources management objectives and problems, and presents an action program to solve these problems.

Tumacacori National Monument was established in 1908 by President Theodore Roosevelt. Presidential Proclamation No. 821 (15 September 1908; 35 Stat. 2205) established the monument to reserve "the Tumacacori Mission, an ancient Spanish ruin, . . . one of the oldest mission ruins in the southwest, . . ." Ten acres were set aside to reserve and protect the ancient Spanish mission community in Southern Arizona (figure 1). The establishing proclamation describes the Tumacacori Mission as ". . . an ancient Spanish ruin, which in the latter part of the sixteenth century, being largely of burned brick and cement mortar instead of adobe, and in remarkable repair, considering its great age . . ." has since been proven factually incorrect. The present mission was established in the last years of the eighteenth century or the first years of the nineteenth century. Also, the mission is constructed largely of adobe, not brick and cement mortar. Additional description of the monument and surrounding area is included in 'Description of the Environment', page 11.

LAND CLASSIFICATION

All lands within the boundaries of Tumacacori National Monument, and all proposed land additions will be Class VI lands (historic and cultural). The monument will be managed and maintained in a manner directed towards preserving the prime historic resources.

MANAGEMENT OBJECTIVES

Resource management objectives have been developed in accordance with the management policies of the National Park Service. To protect and preserve the Tumacacori Mission and to enrich its interpretive story, the following resources management objectives have been approved:

Protect and perpetuate the historic resource by all practical available means.

Maintain the structures as ruins and rehabilitate only for preservation.

Determine carrying capacity and carry out controls precluding damage to the resource.

Include all integral parts of the historic resource in the management and use plan of the mission.

Acquire all lands necessary to protect the visual integrity of the historic scene, and properly tell the story of the Tumacacori Mission.

Minimize the visual and esthetic impact of nonhistoric facilities needed to protect or preserve the historic structures.

All proposals contained within this plan were guided by and concur with the above management objectives, the proclamation establishing the area, and the management policies of the National Park Service. The primary objective of the proposals is to insure the perpetuation of the cultural and natural resources of the monument while simultaneously providing for visitor perception, appreciation and enjoyment.

CULTURAL RESOURCES RESEARCH AND MANAGEMENT ACTIONS

The cultural portion of the resources management plan summarizes and evaluates the cultural resources of the monument. Since cultural resources are fragile and non-renewable, their preservation under current laws, policies, and standards of preservation

is a primary objective of park management. The intent of the plan is to insure that the area is managed as a public preserve within which these resources are strictly protected and preserved.

Basic goals to be met by the cultural resources projects are: to preserve intact the maximum possible amount of significant resources; to complete a cultural resources inventory, in compliance with Executive Order 11593; protection and enhancement of the cultural environment; and to insure that resource studies are of professional quality and preceded by a professionally adequate research design. Information obtained from the suggested studies will be used to plan monument development and stabilization in a manner compatible with preservation of cultural resources, contributing significantly to the historical and archeological background of the area. The plan identifies proposed projects, noting when additional cultural resources information is needed to assess their impact and recommendations are provided to minimize these impacts.

This plan establishes priorities for future archeological and historical research in the monument. A Historic Structures Report underway will provide information necessary for the stabilization of the mission complex (figure 2). A historical agriculture study, a social structure study and a study of communications and trade are also proposed to aid the interpretive program at the monument.

MISSION COMPLEX STABILIZATION

Tumacacori is a mission ruin and is to be preserved as a ruin. Beginning with work in 1921, the emphasis has been on the preservation and stabilization of the mission as it was when the mission became a National Monument. To achieve this, several major projects were undertaken. A roof was constructed over the nave of the church, reproducing to a limited degree the original roof. Surfaces have been plastered to reduce weathering and special drainage and erosion control devices have been installed. The biggest problem with stabilization has been the haphazard and incongruous patching of the church. Most of this patching has been on the external walls. The work has been initiated only when there has been danger of losing the physical resource.

Several long range programs must be implemented if the structural integrity of the mission complex is to be maintained. The evaluation of the condition of the structures at Tumacacori will be part of the Historic Structures Report currently being prepared. On the basis of this evaluation, further stabilization can be systematized and put on a routine basis. Preliminary and secondary phase inspection reports have been completed by Eleazar D. Herreras, James D. Kriegh and Hassan A. Sultan on the standing historic structures at Tumacacori. The reports emphasize the need for prompt stabilization. Failure to act quickly will mean the loss of these important historic structures. Both their report and the investigation for the Historic Structures Report indicate the need for some emergency stabilization. These investigations have revealed real as well as potential problems in the church. Some of these problems follow:

Several of the walls are dangerously cracked.

Moisture migration into the adobe walls have reached an alarming stage.

A significant amount of the remaining original interior plaster is not bonded to the walls.

There is a possible lack of lateral structural support for the church walls.

An Historic Structures Report is being prepared presenting historical, archeological and architectural findings relating to the standing structures at the monument. The report will identify appropriate preservation procedures. In the past, preservation and stabilization activities have been crisis oriented and, hence, somewhat haphazard. The Historic Structures Report will facilitate accurate preservation and will address, but not be limited to, the following areas:

I. General Problems

1. Problems common to all structures and ruins in the complex

-Preservation of historic fabric

-Drainage

-Grade

-Effects of sonic booms and lesser aircraft-induced vibrations

-Effects of vibrations from adjacent highway

-Erosion caused by visitors

-Climatic factors

2. Question of susceptability of complex to earthquake damage

-The strongest earthquake known in recorded American history apparently occurred in this region in 1887, estimated at about 8.7 Richter: Arizona is tectonically active.

3. Lack of historical and architectural data

-Data is lacking on past National Park Service stabilization.

4. Vulnerability to damage by pests

-Damage by such pests as insects, rodents, birds, etc.

5. Moisture in adobe walls

6. Need for adobe stabilization research

-Materials and structural stabilization is needed, some of which is in progress.

II. Problems in the church

1. Moisture in the walls

-The source must be located and halted.

2. Structural stabilization

-Prevent pests (insects, rodents, birds) from attacking wood and adobe.

-Should choir loft be rebuilt for structural soundness?

-Should base of pilasters be rebuilt for added support?

-Should roof be rebuilt and wood treated?

-To avoid structural failure of walls and ceilings, devices should be installed to measure movement at cracks.

3. Maintenance of historical accuracy and integrity

4. Falling plaster

-A method is needed to rebond plaster to walls.

-Is interim emergency stabilization necessary?

5. Replace National Park Service adobe patches

Stabilization of the mission complex is a high priority project. Sections of the church and schoolhouse are considered a hazard to public safety due to structural deterioration and have been closed.

The Historic Structures Report with Architectural, Historical and Archeological Data Sections will provide the basis for preservation and the necessary background for the formation of research designs.

CULTURAL STUDIES

Three special studies are proposed to provide a more accurate and complete interpretation of mission life. Each will require one year and will be carried out by a Park Service historian or by contract.

A historic agricultural study would provide useful interpretive information about life at the mission. The study will attempt to determine what crops were grown, what types of trees comprised the orchard, methods of planting, harvesting and irrigation, and how produce was stored.

A communications and trade study will provide valuable information for interpretive purposes. The study will attempt to determine

communications, trade and supply routes, methods of transportation, sources of supply, items involved, and distribution of articles.

A social structure study will help clarify interactions that existed between the native inhabitants, colonists, military and mission residents. It will also attempt to show the composition of the class structure and group relationships within the mission community.

NATURAL RESOURCES RESEARCH AND MANAGEMENT ACTIONS

Past management of the natural resources has not been guided by a specific plan of action, although good sense has generally prevailed. Some exotics such as tamarisk trees were eliminated as they became old and diseased, and mesquites growing in the ruin areas were cut out during excavation and backfilling. Specific information about the historic vegetation scene is vague. Upon completion of the historic agricultural study and plant inventory, exotic plant species introduced to the area after abandonment of the mission (1848) will be removed.

Historic buildings and ruins must be protected from the deteriorating action of burrowing mammals (pocket gophers, rock squirrels) and the root systems of large woody plants. Until positive identification of all subsurface ruins is made, a policy of plant and animal control will be maintained in areas of known historic ruins.

Plant inventory and map. A vascular plant inventory is presently being compiled for the monument, designating the kind and location of the larger woody species.

The plant inventory and map will be the initial step towards control of exotic plant species. Exotic plant species must be identified prior to removal. Most of the monument staff can identify the larger common species such as mesquite trees and catclaw, however, expertise is needed for complete identification of monument plant species.

A recent local inventory identified 900 larger plants within the monument, 430 of which were mesquite trees. This inventory indicates the extent of vegetation growing in the monument. This more complete inventory will aid formulation of a definitive point

for comparison identification of natural resource trends. When the plant inventory and archeological survey are completed, a plan to eliminate potentially damaging species from historic and archeological sites will be developed.

Animal control. Burrowing by rock squirrels and pocket gophers has a cumulative effect on subsurface adobe remains. In ruin areas backfilled over plastic sheeting, penetration of the plastic permits percolation of surface moisture. This is also the case around foundations of standing ruins. Over a period of fifty years the total effect can be significant.

The present live-trapping and removal program for control of burrownig mammals will be continued. Pocket gophers are extremely difficult to live-trap, and it will sometimes be necessary to use alternate and more suitable methods of removal.

In the past, bat colonies have caused damage to plaster and painted decorations. A combination of wooden doors, heavy mesh doors and windows, and glass windows successfully excludes bats from the interior of the church.

Small sections of original woodwork remains in the church, but has been severely damaged by termites. The application of repellents presently controls further damage.

Species potentially hazardous to visitor health and safety do not exist, but will be removed from visitor use areas when encountered.

Vegetation maintenance. Preservation of the historic ruins is the primary objective concerning maintenance of the monument vegetation. Two different treatments will be followed to achieve this objective. In areas with visible historic structures, or known to contain subsurface remains, mowing will be done to reduce fire hazards. Vegetation will be cut to a height of four inches or more and be limited to the use of hand operated machines to avoid soil compaction. Trees occurring in these areas will be removed and stumps chemically destroyed.

In the remaining areas, the natural vegetation will be encouraged by curtailing mowing unless a potential fire hazard exists during the dry season.

Restoration of the historic scene during the mission period is a second purpose of the vegetation maintenance proposal. This aspect of the proposal would be implemented based on historical research.

SCOPE OF COLLECTIONS STATEMENT

Museum collection study. Collections of objects at Tumacacori National Monument have been acquired from research, field collection and donations.

The following policies will guide future accessions:

Objects should be acquired and permanently preserved which:

would have been used at the Indian Village or at the mission by Indians, missionaries or Spanish residents;

were associated with religious, farming or cattle raising activities at the mission, as any objects of the period which could be found would have immense interpretive value;

can be identified as to function and as belonging to the period.

The collections will represent the time period from 1600 to 1848. The collections are limited by the scarcity of material, as well as a lack of space for either display or storage at Tumacacori National Monument.

Library Collection. Tumacacori has a small, specialized library consisting of about 300 bound volumes plus manuscripts, periodicals and files of material collected through the years. The filed material is in need of collating and binding. There is need for source materials which could aid interpretation and provide a clearer picture of the history of the area.

Tumacacori National Monument should add to its library:

Secondary source materials, periodicals, copies of maps and manuscripts, and any other available materials related

to the history of Tumacacori as a locality, political entity, ethnobotanical and archeological area, and as a National Monument;

Books and other materials relevant to the management of the resource and its collections.

The museum and library collections should be housed in a work and study area apart from the administrative offices, with tables, chairs, filing cabinets and facilities for cataloguing and curatorial services. Such a work-storage area is not foreseeable until a new administration-utility complex is built and adequate staff available for supervision.

Photo Files. Tumacacori's photo files have recently been revised and filed according to subject matter with cross-referencing between prints and negatives. The photos concern the resources of the monument, its history, archeology, stabilization work and associated events.

RELATIONSHIP OF THE PROPOSAL TO OTHER PROJECTS AND PLANS

To insure that cultural resources are not destroyed prior to adequate study and preservation, all proposed development projects in the monument must be identified and assessed to determine impacts on historic or archeological sites. Any project with potential for ground disturbance will be subject to this procedure, and reviewed by an archeologist and/or historian.

The Master Plan and its accompanying Environmental Assessment were approved January, 1976. These approved planning documents form the basis of this resources management plan. A major proposal of the Master Plan is the acquisition of six acres to the north of the present boundaries (figure 2). This additional land will give a visual and protective buffer to the monument.

ENVIRONMENTAL ASSESSMENT

The environmental assessment for the Tumacacori resources management plan consists of the preceding description of the proposal and the following sections.

DESCRIPTION OF THE ENVIRONMENT

Tumacacori National Monument is situated on the flood plain edge of the Santa Cruz River Valley in southern Arizona. It is 18 miles north of Nogales, a major port of entry between the United States and Mexico, and 48 miles south of Tucson, a major population center of Arizona. The monument encompasses ten acres in Santa Cruz County with elevations ranging from 3,247 feet to 3,266 feet.

LOCAL AND REGIONAL ENVIRONMENT

The Monument

The original village of San Cayetano de Tumacacori, which Father Eusebio Francisco Kino visited on his primary expedition into the Santa Cruz Valley in 1691, was situated on the east bank of the river. A ramada was erected there in which he conducted services. Somewhat later, the Piman Indians constructed three small adobe structures there for his use on return visits; one of the three was used as a chapel. Father Kino died in 1711. In the mid-1700s, the village was moved to the west bank of the river and a small, but substantial church was built there. This site is now a portion of the approximately 10 acres that comprise the monument. This first mission came into disrepair and a new larger building, a few yards away from the first, was started around 1800.

Presently the physical historic resources of the monument consists of the partially reconstructed mission church of San Jose de Tumacacori, its excavated and backfilled convento, the campo

santo (burial ground), a portion of the partially excavated and backfilled Indian village, the lime kiln used during the construction of the mission, the mortuary chapel, acequia and a portion of the walled garden that provided fruit and vegetables for the mission community.

Extensive subsurface ruins exist, now covered by low mounds, that once housed the mission community residents. A complete survey has not been conducted for other remains, but their locations are suspected to extend through or near the present housing area.

The full-scale mission resource extends beyond the present limits of the monument. A large portion of the walled garden continues on through the property north and east of the monument boundary. The lime kiln juts into unbuffered farmland and the old Indian village fades into the cattle ranch to the south and east. The resources to the south have undergone major disturbances from ranchers and their facilities.

Modern additions to the monument have included a visitor center, the park staff residences, two double car garages (used as a utility building and maintenance shop), two residential trailers and a pumphouse. In 1937 the visitor center was constructed incorporating architectural features reminiscent of the Spanish-Mexican missions of northern Sonora. The center acts as a funnel through which all visitors must pass to reach the historical resources of the monument. Also present is the well-manicured formal patio garden.

The Region

The early Indian residents of the Santa Cruz River Valley recognized its fertility and grew crops of corn, beans and squash. The Spanish missionaries and colonists diversified the farming of this region by planting orchards and grains, and by introducing livestock. This method of land use was maintained with little change until the early 1960s. Presently the entire region is being drastically changed, with many outside influences affecting the monument.

Industry is being introduced into the formerly agricultural belt due to agreements with Mexico. The Nogales area has become the major center for the transhipment of Mexican farm produce to the United States and Canada.

Increased business, industry and open land has attracted numerous land developers. GAC Industries (formerly Gulf-American Corporation, a Florida based developer) owns Rio Rico, a major development south of Tumacacori. It encompasses 60,000 acres much of which is subdivided and extends northward to the southern vicinity of the monument. The town itself has a resident population of 500, a large motel-convention center, a supermarket-shopping center and a nine-hole golf course. Rio Rico, originally open grazing land, has created a small town that rapidly expanded until the economy slowed down in 1974-75. Although development continues with the addition of new roads and utilities, the earlier projection of 300,000 residents will not be reached in the foreseable future.

Tumacacori is bordered on its west side by an unimproved section of Interstate 19 (I-19). Construction will begin in 1976 on the last 25-mile midsection of I-19 with completion scheduled for the end of 1978. The new dual highway segment will be located approximately one-quarter mile west of the existing road and at a slightly higher elevation.

Once completed, this interstate will connect Nogales to Tucson and link to the system leading northward to Phoenix and Flagstaff. The existing road will become a State-maintained access road. Interchanges on I-19 will be located both north and south of the monument, each leading to the present existing highway. This new stretch of interstate will offer a more panoramic view of the monument from its higher elevation and probably attract more visitors than now stop along the secluded highway.

Surrounding land use and land development affects the monument area. Irrigated cropland borders the east and north sections and the south wall screens a cattle feeding and horse breeding operation. To the west, across the highway is the village of Tumacacori with a few small houses, post office, small restaurant bar, realtor, general store and a wholesale chili-pepper factory. The town itself appears slow and sleepy, but is quite deceptive. Rapid change can be seen in the near future. The current master plan for Santa Cruz County has marked this area for high population density and urban development. As with Nogales this will happen in time with the completion of the interstate highway.

Three miles north of Tumacacori lies the small colonial village of Tubac, which is experiencing a renaissance as an arts and crafts center. Tubac is a combination of Tubac Presidio State Historic Park, numerous shops and producers of high quality art and handicrafts, a country club, golf courses, several restaurants and a limited housing development. This area is rapidly attracting new home owners, more shops and related urban facilities. The resident population is presently just over 500 persons.

Green Valley, a retirement and winter-visitor center, is located twenty-five miles north of Tumacacori with a resident population of 5,000 persons. It has become a small city with middle to upper class housing catering to the retired community, a few family dwellings, rental apartments, resident trailer area, complete shopping center, golf course, country club, churches and community center.

Industrial development at present is confined to the far northern and southern reaches of the above areas. Massive open-pit copper mines yield a low grade ore at the northern boundary of Green Valley, and a comparatively new industry of pecan orchards fills the valley floor to the east and south. Rio Rico is developing an industrial park to the south toward Nogales, which itself is a center for the shipment of produce. The remainder of the region is pasture for livestock and irrigated cropland.

During the past decade the Santa Cruz Valley has undergone slow but steady and visible change. Santa Cruz County, the smallest in Arizona, had a 1973 population of 15,700, a 12 percent increase over 1970 and from 1960 to 1970 showed a 28 percent gain. The population increase from 1970 to 1980 is expected to increase 20 percent for an estimated total population of 19,500.

All of these pressures have put an ever-increasing strain on the available supply of water, and indications are that the carrying capacity limit has been reached. The Santa Cruz River, which begins in Arizona, flows south into Mexico and then turns abruptly north, is dry. Until 1938 water ran in the irrigation ditch (acequia) which historically irrigated the Tumacacori orchard (figure 2). Nogales (Arizona) now carries regular water shortage warnings in the newspapers, imploring people to conserve their

water resources. Lawsuits are pending over water rights in metropolitan Tucson. Anamax Mining Company is quietly buying land in the Santa Cruz Valley for protection of water rights and has purchased the acreage along the monument's north boundary.

Southern Arizona's and Mexico's increasing popularity as vacation areas is reflected in visitation to the monument, which has climbed from 54,364 in 1963 to 78,780 in 1975. February, March and April are the peak visitation months in the monument.

Based on past events, the future trends indicate increases in resident population, travel, visitation, and development of available services. The effects of this on Tumacacori National Monument will be felt as a gradually increasing pressure from visitors within the site and population from without. As visitor use slowly increases, the resources of the monument will require more care and protection. Long-range planning must be continual to be able to cope with the effects of anticipated pressures exerted from outside the monument boundaries.

THE NATURAL ENVIRONMENT

Elements of the natural environment related to proposals of this plan are few. The major resource of the monument is historic and archeological in nature.

Vegetation in the monument is typical of the lower Sonoran desert - mesquite, palo verde, mexican elder, catclaw, lycium, whitethorn and annual and perennial grasses and herbs. In the 1930 a patio garden was established, within the courtyard of the visitor center. It contains ornamentals and a variety of other plants grown by the padres at the mission in historic times. These plants are exotic to the Sonoran desert area, but are historically endemic to the Tumacacori Mission period.

Wildlife is limited to approximately 100 species of birds, and several species of reptiles and small mammals (borrowing rock squirrels, pocket gophers, skunks, bats, woodrats, kangaroo rats and various small mice). There are no known threatened or endangered species existing within the Monument.

Climate

The following discussion adapted from the United States Department of Agriculture, Soil Conservation Service (1972), except where otherwise indicated, describes climatic conditions relevant to visitor's use of the monument, and the effects of meteorological factors on the integrity of the historic and archeological remains. Tumacacori's moderate winter and spring weather produces intense visitation of the monument during these periods. The hot and arid climate of this area decreases the soil erosion.

Occurring within the semidesert climatic zone of southern Arizona, Tumacacori National Monument annually experiences two distinct periods of precipitation: in winter from storms that move into the State from the Pacific Ocean, and in summer from those that move in from the Gulf of Mexico. On the average, about half the annual precipitation - usually between 8 and 18 inches - falls during the period from July through September. During this time of the year most of the precipitation as thundershowers, some of which are accompanied by strong winds, blowing dust, local heavy rains, and occasional hail. Most of these thunderstorms come late in the afternoon or early in the evening. In winter, slightly more rain falls in the afternoon than in the morning. Snow is rare, and when it does fall it generally melts rapidly or lasts only a few hours. May, a transitional period between the winter and summer rains, is the driest month. Heavy rains lasting several days, and storms that bring moisture into the State from the southwest sometimes fall in August or September. Only about five or six storms of this type have occurred in the past 50 years. About once in every 100 years 5 inches of precipitation will fall in a 24-hour period.

Because of its location, the area is characterized by a long, hot season that begins in April and ends in October. From May through September maximum temperatures average more than 90 degrees F., and the average maximum temperature at times exceeds 100 degrees in July. The mean maximum and minimum January temperatures for the monument are 60 degrees and 32 degrees F., respectively: and for July they are 96 degrees and 64 degrees respectively; (United States Department of Commerce, Weather Bureau 1959). Clear skies and very thin, high clouds permit intense heating of the surface during the day and active

radiational cooling at night. Because of this and the characteristic dryness of the atmosphere, the daily range in temperature averages 30 degrees, and on some days it exceeds 40 degrees. Bright sunny days are characteristic of the area. The average annual percentage of possible sunshine at the Tucson International Airport, based on 24 years of record-taking ending in 1965, is 86 percent.

Relative humidity decreases steadily from January until July, the beginning of the thunderstorm season, and then rapidly increases. It decreases again by mid-September, the end of the thunderstorm season, and then increases late in November. For a few short periods during the summer, relative humidity reaches a high enough level to cause some physical discomfort. Based on a record for 25 years ending in 1965, relative humidity at Tucson International Airport at 5 a.m. and 5 p.m., respectively, ranges from 62 percent to 34 percent in January, from 32 percent to 12 percent in May, and from 66 percent to 34 percent in August.

Prevailing winds are from the southwest. The traditional airflow pattern of movement downslope (from the south) during the night and upslope during the day is imperceptible since the monument is about one-quarter of a mile from the river bottom. The highest wind velocity recorded in an 18-year period ending in 1965 at the International Airport at Tucson was 59 miles per hour. Structures built in this area, however, should be designed to withstand gusts of as much as 100 miles per hour.

Evaporation in the area is relatively high, averaging about 70 inches per year - the amount lost from a standard evaporation pan at the Tucson International Airport.

Soils

The soils in the immediate vicinity of Tumacacori National Monument are typical of those found on flood plains, alluvial fans, and valley slopes in the area (United States Department of Agriculture, Soil Conservation Service 1972). They are deep, well-drained, have high available water-holding capacity, and are productive agriculturally, with few limitations on use. They are suitable for use as building sites for homes and industries, and as recreational and wildlife areas.

Hydrology

Due to the monument's location in the valley and small area, no surface water problems are forseen. The present water needs are supplied by a 152-foot deep well drilled in alluvial material adjoining the Santa Cruz River. Water is pumped from the well into a 50,000 gallon, partially buried reservoir. The alluvial material is believed to be constantly recharged from surface water infiltration

THE CULTURAL ENVIRONMENT

Archeological Resources

The sequence of prehistoric human occupation of Southern Arizona is still being reconstructed. Existing material has yielded evidence of occupation dating back more than 10,000 years. Homo sapiens first appeared in the Tumacacori area as hunters of big game and foragers of wild plants. This was the Paleo-Indian Culture (pre 8000 B.C.), noted for its kill sites of mammoths, similar to the Naco and Lehner sites in southeastern Arizona. The Cochise Culture followed, based on a foraging-hunting economy where big game was no longer their primary food resource. Cultivation of maize, squash, and beans were practiced at the close of this phase. This practice led to Mogollon-like cultures east of Tumacacori while the Hohokam culture developed in the riverine valleys to the north.

Four major periods comprise the Hohokam phase of development: Pioneer (300 B.C. to 500 A.D.), Colonial (500 A.D. to 900 A.D.), Sedentary (900 A.D. to 1200 A.D.) and Classic (1200 A.D. to 1400 A.D.). From 500 A.D. the Hohokam sphere of influence gradually decreased. The Sells phase, a subunit of the Classic period (1250 A.D. to 14pp A.D.) has been associated with the desert area just west of Tumacacori. It is speculated that the Papago are descendents of these prehistoric Sells phase occupants of the Papagueria.

Archeological Research

The remains of the Franciscan Mission - San Jose de Tumacacori - represents the resources of Tumacacori National Monument. The most impressive of these remains are the graveyard, mortuary chapel, granary and convento or "schoolhouse". Less obvious but far more extensive, are the low mounds that contain the remains of other structures. All of the remains have received some testing in the past 50 years. Four major excavations have been accomplished near the mission: 1) Frank Pinkley in 1921, 2) Paul Beaubien, December 1934 to March 1935, 3) Sallie Brewer, April 23 to May 10, 1951, and 4) Louis Caywood in 1964.

Frank Pinkley dug in and around the mission in 1921 looking for the mission bells. His project was actually designed to find features to aid in the stabilization of the church. The artifacts and stabilization features of his research were inadequately reported but large sections of the church were saved through his work. Pinkley described some of his research in notes which were printed in the "Southwestern Monuments Monthly Report, Supplement of October 1936."

In 1934, under the auspices of a Federal Emergency Relief Act project, Paul Beaubien organized a project to uncover the rooms near the mission. The plan was to expose, map and backfill as many walls and special features (furnaces, benches, ovens) as possible with the funds available. This map was to serve as the guiding document for landscaping and restoring the mission. It was also hoped that some of the blank pages of Tumacacori's history would be filled, and that artifacts for the museum would be recovered.

Beaubien excavated and backfilled parts of 79 rooms and areas outside the church and three rooms within the church. In all, about 100 units were exposed, mapped, and backfilled. In most rooms an "island" of fill was left untouched by the excavations along the walls. Along with leaving most room-centers untouched, Beaubien did not disturb any walls or floors. Subfloor testing was done in areas disturbed by previous pothunting. Unfortunately, most of the rooms excavated were found to have been highly disturbed by treasure hunters.

Beaubien achieved his major objective of providing maps of most walls and structures just below the surface. Prior to Beaubien's

work very little was known about the actual plan of the mission complex. Treasure hunting over the past 100 years resulted in damaged structural remains and some loss of noteworthy artifacts. However, through his efforts, a great deal of new information was made available. He was able to assign some rooms to separate phases of the Spanish occupation on the basis of distinctive plaster. One of his most interesting conclusions follows:

> One thing quite obvious on the map of the ruins is that the area of Tumacacori National Monument is too small. The lime kiln is some 50 feet beyond the north boundary; several acres of the small orchard lay north and east of the Monument, while the south wall of the Monument was built across the series of rooms which formed the west side of the plaza. Just south of these later rooms was the brick kiln (identified by Mr. Frank Pinkley . . . in 1921), while southeast of the kiln is a ditch which supplied water to the village . . . (Beaubien 1937).

From April 23 to May 10, 1051, excavations were conducted by Sallie P. Brewer to determine whether a realignment of Highway 89 and a parking lot would destroy historically significant resources. An area of 70 feet by 480 feet along the west boundary was trenched by Brewer to examine the existence of historically important remains and salvage any cultural materials. She concluded that, "Indians of the mission Tumacacori undoubtedly used this area, but the area does not contain buildings of the mission plant proper, or any exhibitable remains of historical importance . . ." (Brewer 1951). Her report also describes the excavation of each of the 25 trenches and briefly describes the artifacts that were found.

In October 1964, Louis R. Caywood (Caywood 1965) re-excavated the north wing of the convento. He also uncovered the lime kiln used now for display and interpretive purposes. The rooms were never stabilized and are now backfilled. A very brief report of the 1964 excavation is on file at the Arizona Archeological Center. In 1967, Roland Richert (Richert 1965) re-excavated and stabilized the small church. Martin T. Mayer (Mayer 1970) cleared the granary in 1970 and stabilized it.

Tumacacori has never been intensively surveyed. Edward Danson examined the site as part of a superficial Santa Cruz Valley survey but very little information was included concerning

Tumacacori. None of the excavation reports are adequate for today's standards. The work was not carried out as a coherent research plan, but was instead stimulated by crisis-oriented stabilization needs. In general, the reports stress architectural detail and neglect archeological data.

Past Stabilization: 1918 to Present

Date	Activity
1918-21	Frank Pinkley cleared debris from the church ruins and initiated excavations to acquire information about the original roof.
1921	Various areas of the church and its roof were partially restored.
1923 (approx.)	The broken offset around the bell tower was restored.
1924	Frank Pinkley excavated and restored the church cistern.
1938-39	Minor restoration continued inside and outside the church; cemetery wall was rebuilt and capped and a brick floor was laid in the nave of the church by Tovrea.
1944	Ted C. Sowers experimented with soil cement adobes on the east wall of the church.
1946	Dale S. King treated the mortuary chapel and the north and east walls of the sacristy with soil and cement. He also restored the brick and plaster pedestals and columns on the front of the church.
1947	A new roof was erected over the nave of the church.
	Charlie R. Steen stabilized the church baptistry and James A. Lancaster did some repair work on the bell tower.

1945-48	Earl Jackson put steel reinforcing over the dome and replaced a mission column in the church.
1949	C. R. Steen cleaned the remaining original plaster, analyzed original paint and applied a spray coat of vinyl acetate as a paint fixative.
	Lamar Cotton was contracted to install glass windows and replace floor tiles in the church.
1951	E. Jackson patched the sacristy roof.
1954	Gordon Vivian stabilized several areas of the church and constructed drainage systems in the schoolhouse.
1955	G. Vivian excavated several rooms in the convento.
1959	Joel Shiner reconstructed the sacristy roof with a perlite and concrete mixture and painted it with waterproof latex paint.
1960	Roland Richert repainted the sacristy roof because the paint applied in 1959 did not adhere.
1961	R. Richert repaired the lantern cupola and resurfaced the sanctuary dome.
1963	E. Jackson wrote a report on the building sequence for the mission which is presently considered the most accurate reconstruction of Tumacacori's architectural history.
1968	Don Morris backfilled the convento excavations to retard deterioration of the adobe walls resulting from exposure to wind and rain.
1969	P. L. Daily Roofing Company of Tucson roofed the main church and painted the barrel vault of the sacristy.
1970	Martin T. Mayer and Tom Caperton undertook a massive stabilization project on the granary and church. The foundations of the nave walls were exposed on the exterior and a P.V.C. membrane glued on. The granary was re-excavated and stabilized.

1972 Sam Henderson repaired the brick capped ledge on the west side of the church and installed a waterproof liner.

1973 Edward Sudderth capped the bell tower and replaced eroded and wet adobes at the entrance of the baptistry and on some portions of the interior surface of both the east and west nave walls.

Historical Resources

In one of history's phenomenal bold strokes, Spain, a newly emerging nation of Europe, happened upon, and in a generation laid claim to, a whole new world. To hold it, she developed a system of imperial institutions faithfully reflecting the Spanish union of church and state. The frontier mission, designed as a dynamic instrument of expansion, satisfied the crown's obligation to Christianize the Americas and at the same time Hispanicize the native people and proclaim Spanish occupation.

When the Jesuit, Eusebio Francisco Kino, approached the Pima Rancheria of Tumacacori with his entourage in January 1691, he rode the tide of a century. From small beginnings and the first martyrdom in Sinaloa 500 miles to the south and 100 years before, the Jesuits had built a missionary empire that straddled the Sierra Madre Occidental, and welled up New Spain's west coast corridor. They had reaped tens of thousands of baptisms and had made themselves the most powerful social and economic corporation in an immense region. But the tide would carry them no further north than Pimeria Alta.

There may have been 30,000 Pimas Altas. Culturally they differed considerably, from semi-sedentary irrigation farmers to nomadic gatherers. Toward the more-or-less permanent rancherias of the "river Pimas", which varied in population from a few dozen to a few hundred, the missionaries directed their primary efforts. The less sedentary desert people, the Papagos, served as a reserve to be enticed or forced into the missions as the river Pimas died off.

Between 1687 and 1711, Kino dominated Jesuit endeavor in Pimeria Alta. As he explored and mapped the region, he passed back and forth through San Cayetano de Tumacacori. He doled out trinkets,

seed, and livestock, preached, and had the natives build for his visits "an adobe-walled house." With Father Kino, it was Christianity on their terms, with plenty of benefits, and few demands.

Two decades of missionary neglect followed Kino's death. Then, in 1732, three Jesuits were sent to refound the northern missions - Suamca, Guevavi, and Bac. Tumacacori, along with Sonita, Arivaca, and Tubac, became visitas (mission outposts) of Los Santos Angeles de Guevavi, 15 miles upriver to the south. When the new padre moved in, he provoked the Indians' resentment by treating them as wards, and making them work at building, praying, and ranching when they would rather not; by suppressing their ceremonials and by deriding their medicine men as witches.

In 1751, the Pimas of the Alta Valley southwest of Tumacacori rose in rebellion and slaughtered two Jesuits and more than a hundred others. In sympathy, the natives of Guevavi and its visitas fled to the hills. The rebels sacked the Guevavi church that Father Joseph Garrucho was just finishing. Arivaca never recovered. As a result of the uprising, Captain Juan Thomas Belderrain - later buried in the Guevavi church - founded a 50-man presidio at Tubac. At the same time - the spring of 1753 - he resettled the Indians of San Cayetano and those of Tubac on the west bank site known as San Jose de Tumacacori. This site has survived to this day. Soon after, the Jesuit Francisco Xavier Pauer took over the mission.

Pauer renovated the church and convento at Guevavi, a classic frontier mission complex whose enduring ruins deserve protection. Late in 1756, he baptized 78 Indians at Calabazas, which became a new vista on the river between Guevavi and Tumacacori. A decade later, Charles II, for political reasons, abruptly banished the "blackrobes" (Jesuits) from all his realms.

The Jesuit period at Guevavi and Tumacacori has spanned 76 years, from 1691 to 1767. A succession of 11 missionaries had actually lived at Guevavi for a total of 33 years, mostly after 1732. During the Franciscan period, which began in 1768 and lasted another 76 years, two dozen friars lived at the mission for a period covering 60 years. By 1771, they had transferred their residence from Guevavi to Tumacacori.

The priests of the Franciscan missionary college in Queretaro (grayrobes), who inherited Pimeria Alta, suffered all the woes that had blunted the momentum of the conquering Jesuits--restive neophytes, Apache hostility, disease and dwindling native population, encroaching settlers, the lack of government support, and the liberal reformers who sought to destroy the traditional mission as in institution.

As Apache pressure intensified, the missions contracted. By 1774, Guevavi lay deserted. The refugees from there, and from Sonoita to the east, now huddled near Calabazas. At Tumacacori in the early 1770s, the friars patched and redocorated the church, built adobe dwellings for the Indians, and put up a wall around the entire community. At Calabazas they roofed the open church walls left by the Jesuits.

The Tubac garrison seemed helpless to cope with the multiple problems. In 1776, as part of the military reorganization, the garrison was transferred to Tucson, 50 miles north. The abandoned Tubac settlers held out for 4 years, then moved to the Rio Colorado, where a number of them died in the Yuma massacre of 1781.

Calabazas, the last vista, succumbed in 1786, leaving only Tumacacori. Hardly a hundred mission Indians remained. The following year an 80-man Pima Indian company reoccupied the old presidio of Tubac. For the next sixty years, Tumacacori and Tubac stood alone in the middle of Santa Cruz Valley. Mission and presidio drew together. They shared grazing land and water from the river. Surplus mission produce found a market at the presidio. The friar served as both missionary and chaplain. Tumacacori Indians joined the garrison. Families from the mission and presidio merged.

A visitor to Tumacacori in 1797 described the frequently repaired Jesuit church as very small and narrow with adobe walls and flat, viga-supported roof. Within 5 years, Fray Narciso Gutierrez, whose Tumacacori ministry lasted a quarter-century, had begun building a new and much larger church modeled on the grand structure at San Xavier del Bac. But his mission's poverty and the Mexican wars for independence retarded construction.

When Gutierrez died in 1820, the new church was far from complete. His short-term successor sold 4,000 cattle to raise funds, and the last resident missionary, Ramon Liberos, collected the debt.

Late in 1822, Father Liberos transplanted the remains of Father Gutierrez and another friar from the old to the new church. The hulking temple had finally been put to use, along with the walled cemetery and the renovated convento. Physically, the mission community - church complex, adjacent Indian pueblo, and surrounding lands - had reached its apex. Yet the friars never finished. When Father Liberos was forced by a Mexican decree against Spaniards to leave Tumacacori in 1828, the scaffolding still clung to the bell tower.

For the next twenty years, the Indians at Tumacacori, the skeleton Tubac company, and the few poor settlers hung on. The Apaches took pretty much what they wanted. Once or twice a year a circuit-riding priest visited the valley. Without a resident missionary to protest, non-Indians encroached on mission lands. The Tumacacori grant, a narrow strip stretching along the river that was surveyed and deeded at Father Gutierrez's urging in 1807, fell to a clique of Mexican politicos in 1844, who fraudulently claimed that the land was vacant. In this way they gained title to the entire grant.

In December 1848, the 157-year thread of continuity begun by Father Kino finally snapped. In a series of brutal raids, the Apaches drove the last mission Indians from Tumacacori. They never returned.

The rest is epilogue. In 1846, the U.S. Army belatedly took possession of the valley. Miners and ranchers vied with Apaches for another 30 years. Homesteaders staked claims, and monied interests contested in court over sprawling grants. Even as the mission at Tumacacori crumbled, its tradition continued to affect the local people. Well into the 20th century they observed Holy Week there, and buried their dead in the cemetery.

Even now at San Xavier del Bac, the Piman descendants of Tumacacori's last neophytes remember their ties. Mexican-Americans too, from Nogales to Tucson, consider the mission a

part of their heritage. The story of Tumacacori - a frontier mission community closely related to Tubac, Calabazas, and Guevavi, and once linked to them by a historic trail - offers a meaningful legacy to the people of three cultures today.

Historical Research: 1933 to 1972

Date	Activity
1933	Carl Russell and Robert Rose spent two weeks in Arizona and Sonora studying the missions around Tumacacori.
	C. Russell continued his research at the Bancroft Library, Berkeley, California and submitted a preliminary outline on the history of the Sonoran missions in November 1933.
1934	H. E. Rensch devoted several months intensively researching Tumacacori in the University of California Libraries. He produced a thorough report titled "Chronology for Tumacacori National Monument, with Bibliography."
1936	Scofield DeLong and Leffler B. Miller completed their comparative study of architecture of the Sonoran missions, "Architecture of the Sonora Missions, Sonora Expedition, October 12-29, 1935."
	Arthur Woodward completed his report, "Historical and Archeological Aspects of the Sonora Missions."
	Robert Rose conducted further research on the mission documents preserved in the Bancroft Library. Excerpts from baptism, marriage and burial records appear in "Kino Mission Records," Southwestern Monuments Report, November 1936.
1951	Earl Jackson wrote a historical summary of Tumacacori, "Tumacacori's Yesterdays," which was printed as one of the "Southwesterm Monuments Association Popular Series."

1972 John Kessel completed the most recent report on Tumacacori, "Franciscan Tumacacori, 1767-1848: A Documentary History."

A vast amount of Spanish literature on Southwestern missions is available of which a substantial number applies directly to Tumacacori. The majority of these references are listed in a bibliography compiled by Bernard L. Fontana of the Arizona State Museum.

Research Collection

Research collections from Tumacacori consists of objects acquired through research, field collections and donations. The archeological collection is small but representative and includes primarily lithic material; as projectile points, shaft straighteners and metals and numerous ceramic fragments. Spanish items include recently acquired statues (santos), a dozen pieces of armament; metal stirrup, morteritos, boots and reproductions of religious articles.

A total of 272 artifacts have been catalogued from the Caywood excavation, however, the remaining materials are left uncatalogued. These include nine boxes from Beaubien and several boxes from Brewer's excavation. In addition, the Western Archeological Center has 15 boxes of artifacts from miscellaneous sources, eight of which are type sherds from the Tumacacori vicinity. Because the collections are limited, they have little research value and much of the archeological material is of unknown origin.

The entire monument has been placed on the National Register of Historic Places. As a property on the national register, all proposed federal actions within the area require compliance with Section 106 of the National Historic Preservation Act of 1966, Public Law 89-665.

PROBABLE FUTURE ENVIRONMENT WITHOUT THE PROPOSAL

Degradation or possible loss of resources may occur without the proposed research and adequate protective recommendations. Future efforts to properly manage and interpret the area will also suffer from insufficient data. Available information of the area's archeological resources will remain fragmentary and in some instances of questionable accuracy.

If the proposed mission preservation is not implemented, this valuable cultural resource of national significance will continue to deteriorate leading to eventual loss.

If the various cultural/historical resource studies are not implemented, interpretive and management information will remain fragmentary and in some cases unreliable. More details are needed concerning agriculture, communication, trade and social structure to accurately reconstruct the history of Tumacacori.

Without the proposed natural resource studies, Tumacacori will continue to lack information necessary for the efficient management of the area's natural resources. Monument ruins (visible and subsurface) must be protected from further deterioration through careful management of the native and non-native plants and animals.

ENVIRONMENTAL IMPACT OF THE PROPOSED ACTIONS

The intended impact of the cultural portion of this plan is to prevent or minimize losses to historic fabric and provide for the professional study, management and interpretation of the area's historical and archeological resources.

The research program will identify and document stabilization within the monument and insure the preservation and longevity of the area's ruins. In some cases, stabilization efforts may replace or mask original ruins walls with foreign building materials and alter cultural remains in and surrounding the ruins. The proposal will arrest the natural and human-caused erosion and minimize alteration of the historical fabric.

A plant inventory and map will provide the monument staff with the knowledge to limit and control exotic plants. This will provide a definitive point for future comparison and indication of natural resource trends. Removal of some native vegetation will be necessary where root systems may cause deterioration of subsurface ruins. The control of grasses will enhance the setting and reduce fire hazard potential.

The proposed animal control will also aid in preserving the ruins and other historical structures. This action will remove the populations of bats, burrowing mammals and boring insects.

The plant inventory and archeological and cultural studies will provide recommentations and lead to a management plan to control exotics and eliminate potential damage (through root action) from archeological sites. The elimination of exotics will also assist in restoration of the area to a more nearly accurate portrayal of the mission community prior to 1848. This proposed action may cause some limited soil erosion, a reduction in available feeding and nesting areas for birds, and reduction in potential fire hazards.

MITIGATING MEASURES INCLUDED IN THE PROPOSED ACTIONS

The proposed actions are designed to reduce or eliminate significant adverse effects on the monument's cultural and natural resources.

Any adverse effects of cultural deposits and natural resources surrounding ruins selected for stabilization will be minimized. Pre-stabilization studies will minimize any loss of cultural information.

Approved Department of Interior procedures and regulations will be used when controlling burrowing mammals, rodents, insects or vegetation in the ruins or historic structures.

Where feasible, stabilization repairs will be made with an adobe mortar to maintain original texture and appearance. The Historic Structures Report will precede any form of restoration. All preservation and restoration work will conform to the specifications and guidelines presented in the report. The effect of

restoration on cultural deposits surrounding the structure will be evaluated in the report. If excavation of the fill is necessary it will be conducted with a professional research design.

While conducting the proposed plant inventory, if it becomes necessary to remove species under stress for sampling, sample sizes will be limited to the minimum necessary for identification, statistical analysis or catalogue record.

Prior to initiation of any action requiring ground disturbance a professional archeologist will conduct a survey of the area to be affected. If materials not identified by the survey are located, all work in the vicinity will stop until a professional archeologist can assess the situation.

Actions that may cause compaction of known or potential subsurface ruins will be reviewed by an archeologist and/or historian.

ADVERSE EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

Stabilization efforts may replace or mask original ruin walls and cultural fill in and surrounding the ruins

Any excavation required for ruins stabilization will permanently alter archeological evidence from the site.

In recreating the historic scene of vegetation, present plant communities will be altered or destroyed. Some animal species will die or be forced to move due to alteration of their habitat. Consequently, new animal species will invade this newly developed habitat.

THE RELATIONSHIP BETWEEN SHORT-TERM USES OF OUR ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Tumacacori's maximum long-term productivity can be realized through the proposed plan which provides for preservation, appropriate research, and visitor appreciation of the area.

No short-term uses which will interfere with long-term productivity are proposed. The proposals limit short-term uses in order to provide for long-term productivity.

Preservation of the cultural and natural resources is the primary objective of park management. Tumacacori is a public preserve whose resources are strictly protected and will be disturbed only when there are no alternatives to meet management needs.

The proposed cultural studies and preservation procedures will lead to the accomplishment of long-term goals. The maintenance of historic and structural integrity of cultural resources and surrounding environment will insure historical context. These actions will minimize the adverse effects of short-term uses, such as visitor use, stabilization and ground-disturbing construction.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTIONS SHOULD IT BE IMPLEMENTED

Any excavation of archeological or historical sites permanently commits and disrupts the context of these remains. This plan will minimize excavation within the monument and insure optimum data recovery from necessary excavations by professionally adequate planning and research design.

Stabilization permanently alters or replaces historic fabric. Pre-stabilization study and field note re-study will minimize loss of information during stabilization procedures.

The proposed natural resource actions do not involve any irreversible or irretrievable loss of the monument's natural resources. Similar considerations have been taken to prevent any loss of cultural resources. No known critical habitat for threatened plant or animal species will be affected by the plan actions.

ALTERNATIVES TO THE PROPOSED ACTION

Mission preservation. No action would result in further deterioration and eventual loss of the monument's prime resources. It

would also ignore the Park Service responsibility to preserve the ruins. Continuation of piece-meal stabilization and preservation would be expensive and less effective and has been shown to be unsatisfactory by past experience. If attempts to reconstruct the complex to its 1848 appearance were made, the task would be immense. It would also be counter to the proclamation charging the Park Service to protect the remains.

Cultural studies. No action on the studies would deny the monument necessary information to understand and interpret mission life.

Plant inventory and map. Lack of specific knowledge concerning identification and prevalence of exotic species makes accurate restoration of the historic scene of the mission community impossible.

Animal control. With no action, damage to historic ruins would continue through the action of burrowing mammals, boring insects and bats. The result would be structural weakness, increased potential for erosion and further loss of fragile painted decorations.

Maintenance of surrounding area. With no action, damage to historic ruins through root action would continue, visual esthetics would be impaired, and the risk of damage from fire would be higher. The use of herbicides and soil sterilants runs the risk of being ineffective against larger plants and non-selective with smaller ones. The possible residual effects of the herbicides on plant and animal life are detrimental. To mow the entire area would tend to discourage proliferation of native species.

CONSULTATION AND COORDINATION

During preparation of the resources management plan and environmental assessment, other agencies and individuals were consulted for their knowledge and recommendations.

Bernard L. Fontana, Arizona State Museum
University of Arizona Engineering Experiment Station

Informational copies of the plan and environmental assessment will be sent to the following organizations and individuals and their comments will be solicited. All letters of comment received will be reviewed for implementation by the Superintendent. Copies of the plan, assessment and public comments will be available at Tumacacori National Monument and the National Park Service, Western Regional Office, San Francisco.

Arizona State Historic Preservation Officer
Arizona State Department of Fish and Game
Museum of Northern Arizona
Sierra Club

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MANAGEMENT PROGRAM

The management program appended here to the plan, is the action document designed to implement the plan. The management program consists of:

A List of Resources Projects on which recently completed, currently active, and proposed resource activities are summarized.

Resources Project Statements that will serve as "blueprints" for proposed actions.

A Resources Project Programming Sheet on which each project will be listed and shown in relation to park priority, funding, and manpower requirements, and a time sequence for the five-year period.

While the resources management plan is concerned with a proposed long-term action program, the management program deals with the next five years only. The program presented here begins with Fiscal Year 1977. Each subsequent year, the management program will be revised and updated for a new five-year period as work is completed and new projects are proposed.

LIST OF RESOURCES PROJECTS

Reference Number	Project Title	Status of Project
H-1	Mission Church Preservation	3 years to completion
H-2	Agricultural Study	1 year to completion
H-3	Communications and Trade Study	1 year to completion
H-4	Social Structure Study	1 year to completion
N-1	Plant Inventory and Map	2 years to completion
RM-1	Animal Control	As needed
RM-2	Vegetation Maintenance	As needed

CULTURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Mission Church Preservation (TUMA-H-1).

3. STATEMENT OF PROBLEM: Stabilization of the standing buildings in the mission complex is urgently needed. The mission church, the principal resource of the monument, is suffering continued deterioration due to constant exposure to the elements. It has been weakened structurally over the years and could sustain severe damage in the event of an earthquake. Other standing structures which require stabilization include the granary, schoolhouse, mortuary chapel and lime kiln. Prior to stabilization, the Historic Structures Report will be completed. The Historic Structures Report is an in-depth study of the structural integrity of the mission church and related buildings. In addition, it will present such historical, archeological and architectural information as is necessary to permit the appropriate level of treatment (preservation, restoration or reconstruction).

4. WHAT HAS BEEN DONE: The numerous archeological and historical reports regarding Tumacacori have been recently synthesized into one study. Reports such as the one by James Kriegh, Hassan A. Sultan and Eleazar D. Herreras will be consulted during preparation of the Historic Structures Report. Since 1921, the mission church and related structures have undergone repair on a number of different occasions. This action, however, has been in response to specific stabilization needs and has been accomplished in a piece-meal fashion. At no time has there been a concentrated, full-scale effort to stabilize entire structures.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: The project will involve further research on the historical structures comprising the mission, as well as on the archeological resources present. Emergency stabilization will continue during preparation of the HSR when needed. The church will be stabilized as it was when the mission became a national monument. The only restorations will be those that are necessary for the preservation of the structure. The HSR will produce a base map of the monument surrounding area. Remote sensing techniques could be utilized in the survey. The survey will include any additional land acquired by the monument.

6. LENGTH OF TIME NEEDED: Four years.

   Stabilization: continuous

   Historic Structures Report: two years

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Failure to implement this project will result in the loss of historic information and fabric due to continuing deterioration. Without the Historic Structures Report, any stabilization or restoration work would lack the historical background necessary to assure accurate representations. The interpretive program also would suffer, since it would not present a complete and accurate picture of mission life. We would also lack a detailed base map of the area.

8. WHAT ARE THE ALTERNATIVES:

   a. No action.

   b. Continued piece-meal stabilization and restoration.

   c. Historical reconstruction of the church as it was at the time of abandonment in 1848.

9. PERSONNEL:

   a. Stabilization: Division of Cultural Properities Conservation of the Western Archeological Center.

   b. Historic Structures Report: Denver Service Center, Architect Anthony Crosby.

   c. Archeological Survey: A synthesis of previous archeological investigations was completed by Lynette Shenk in 1976. Any additional investigations will be done by the Western Archeological Center or by contract.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	158,000	83,000	89,000	300,000	
Other than personal services	0	0	0	0	
GRAND TOTAL	158,000	83,000	89,000	300,000	
Funds available in park base	0	0	0	0	
Funds requested from Regional Office	158,000	83,000	89,000	300,000	

On Form	Date Submitted
10-238, Pkg. #122	October 1973

11. MANAGEMENT AND ASSESSMENT NEEDS:	Required	Completed
a. List of Classified Structures		X
b. Nomination to the National Register of Historic Places		X
c. Section 106 Report	X	

12. REFERENCES AND CONTACTS:

a. Anthony Crosby, Project Coordinator, Denver Service Center.

b. University of Arizona Engineering Experiment Station.

c. Dr. Bernard Fontana, Arizona State Museum.

d. National Bureau of Standards.

e. Hank Jud, Bob Utley, WASO.

f. Los Alamos Scientific Laboratory

13. DATE OF SUBMISSION:

CULTURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Agricultural Study (TUMA-H-2).

3. STATEMENT OF PROBLEMS: A study of agricultural practices to provide interpretive information about life in this mission community. The study would attempt to determine the crops that were grown, the types of trees which comprised the orchard, the techniques and tools that were used in planting and harvesting, water supply and water use, the ways in which the produce was stored, etc. The research would determine what exotic plants were brought into the area during the mission period.

4. WHAT HAS BEEN DONE: Nothing.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: The project will involve detailed historic and ethnographic research. Information will be presented in report form.

6. LENGTH OF TIME NEEDED: One year.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Failure to implement project would result in a lack of needed interpretive data. A complete and accurate picture of mission life could not be interpreted.

8. WHAT ARE THE ALTERNATIVES:
No action.

9. PERSONNEL: The research will be conducted by a professional ethnohistorian from a qualified institution.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	2,500				
Other than personal services	0				
GRAND TOTAL	2,500				
Funds available in park base	0				
Funds requested from Regional Office	2,500				

On Form	Date Submitted
10-237	October 15, 1976

11. MANAGEMENT AND ASSESSMENT NEEDS: None

12. REFERENCE AND CONTACTS:

Bernard L. Fontana, PhD; Arizona State Museum, Tucson, AZ

Rev. Charles Polzer, S.J., PhD; 2844 E. First St., Tucson, AZ

13. DATE OF SUBMISSION:

CULTURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Communications and Trade Study (TUMA-H-3).

3. STATEMENT OF PROBLEM: A communications and trade study is an area of needed research at Tumacacori. Such a study would add valuable information to the interpretive program and enhance the story told at the monument. This type of information is necessary if a true awareness of Spanish colonial history is to be imparted to the visitor.

4. WHAT HAS BEEN DONE: Nothing.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: The purpose of the project is to determine the types of communication, trade and supply routes and methods of transportation used by the Spanish colonists in the Pimeria Alta between 1700 and 1821 A.D. Included in the study will be information on sources of supply, items involved, how requests were determined and made, payment, frequency of travel, what special problems were involved and the distribution of articles. Special emphasis will be placed on the Santa Cruz Valley.

6. LENGTH OF TIME NEEDED: One year.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Failure to implement this project would detract from the interpretive program at the monument and deprive the visiting public of a fuller understanding of the complexity of the Spanish colonial frontier.

8. WHAT ARE THE ALTERNATIVES:
No action.

9. PERSONNEL: By contract

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	2,500				
Other than personal services	0				
GRAND TOTAL	2,500				
Funds available in park base	0				
Funds requested from Regional Office	2,500				

On Form	Date Submitted
10-237	October 15, 1976

11. MANAGEMENT AND ASSESSMENT NEEDS: None

12. REFERENCES AND CONTACTS:

Bernard L. Fontana, PhD; Arizona State Museum, Tucson, AZ

Rev. Charles Polzer, S.J., PhD; 2844 E. First St., Tucson, AZ

13. DATE OF SUBMISSION:

CULTURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Social Structure Study (TUMA-H-4).

3. STATEMENT OF PROBLEM: Due to lack of information, the visitor is not aware of Spanish colonial influence and especially the role played by the mission community. This study will provide the information needed to help the visitor obtain a better understanding of the history of the area.

4. WHAT HAS BEEN DONE: No complete or detailed work on this subject has ever been done at Tumacacori.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: The study will attempt to determine the types of interaction among the native inhabitants, colonists, military and mission community residents during the period from 1700 to 1821 A.D. It will discuss the composition of the class structure with all of its various members, levels and derivations.

6. LENGTH OF TIME NEEDED: One year.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Failure to implement this project will result in the lack of important interpretive information required to give the visiting public a better understanding of the Spanish colonial frontier.

8. WHAT ARE THE ALTERNATIVES:
No action.

9. PERSONNEL: By contract.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	2,500				
Other than personal services	0				
GRAND TOTAL	2,500				
Funds available in park base	0				
Funds requested from Regional Office	2,500				

On Form	Date Submitted
10-237	October 15, 1976

11. MANAGEMENT AND ASSESSMENT NEEDS: None

12. REFERENCES AND CONTACTS:

Bernard L. Fontana, PhD; Arizona State Museum, Tucson, AZ

Rev. Charles Polzer, S.J., PhD; 2844 E. First St., Tucson, AZ

13. DATE OF SUBMISSION:

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Plant Inventory and Map (TUMA-N-1).

3. STATEMENT OF PROBLEM: The variety and distribution of plants present within the monument has not been accurately recorded. A total inventory is essential prior to management of plant communities, including elimination of exotics.

4. WHAT HAS BEEN DONE: A cursory local survey has been conducted identifying the larger woody species.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: Prepare an inventory of all the vascular plants within the monument and a map indicating the location and distribution of the larger woody species. Special attention will be given to the identification of all species introduced into Arizona after the abandoment of the mission in 1848.

6. LENGTH OF TIME NEEDED: One year, unless summer rainfall is absent.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: The past, present and future status of exotic plants will remain undetermined. The lack of knowledge prevents the elimination of exotics and the restoration of the historic scene. Removal of plants causing damage to archeological sites will be based on insufficient data.

8. WHAT ARE THE ALTERNATIVES:
No action.

9. PERSONNEL: Graduate student from local university.

10. ADMINISTRATION AND LOGISTICS: Travel expenses for personnel to and from monument.

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	1,100				
Other than personal services	700				
GRAND TOTAL	1,800				
Funds available in park base	0				
Funds requested from SOAR reserves	1,800				

On Form	Date Submitted
10-237	June 30, 1974

11. MANAGEMENT AND ASSESSMENT NEEDS: None

12. REFERENCES AND CONTACTS:

Dr. Dave Mouat, University of Arizona, Office of Arid Land Studies; Phoenix, AZ

13. DATE OF SUBMISSION: June 30, 1974

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Animal Control (TUMA-RM-1).

3. STATEMENT OF PROBLEM:

   a. Burrowing animals cause structural damage to archeological ruins and subsurface remains.

   b. Burrows accelerate soil erosion problems.

   c. Boring insects damage original structural woodwork.

   d. Bats cause interior damage to plaster and painted walls.

   e. A few animals may be hazardous to the health and safety of the park visitor.

4. WHAT HAS BEEN DONE:

   a. Some control measures have been used on burrowing mammals:

      1) live-trapping

      2) sulfur bombs

      3) treated bait

   b. Church windows and doors have been screened or otherwise closed to eliminate entrance of bats.

   c. Professional termite fumigation techniques.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

   a. When feasible, live-trap rock squirrels and pocket gophers with removal from sites where potential damage may occur to standing and subsurface ruins, or cultivated plant species in the formal garden.

   b. When live-trapping of pocket gophers is not successful, they will be controlled through use of snap-traps.

   c. Termite control in historic wood will be maintained through use of pentachlorophenal or similar chemical.

d. Professional treatment of original woodwork in historic structures will be used to aid control of termites when necessary.

e. Species potentially hazardous to to the health and safety of park visitors (especially black widow spiders) will be eliminated from high visitor use areas.

6. LENGTH OF TIME NEEDED: Continuous.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

a. Gradual soil erosion

b. Deterioration of historic resources

c. Potential hazards to visitors

8. WHAT ARE THE ALTERNATIVES:

a. No action

b. Use of other residual poisons

9. PERSONNEL: Maintenance staff.

10. ADMINISTRATION AND LOGISTICS:

Funded from ONPS base

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	500				
Other than personal services	100	Est. 10% increase per year			
GRAND TOTAL	600				
Funds available in park base	600				
Funds requested from Regional Office	0				

On Form	Date Submitted
	Annually

11. MANAGEMENT AND ASSESSMENT NEEDS: None

12. REFERENCES AND CONTACTS:

Department of Zoology and Entomology; University of Arizona, Tucson, AZ

U.S. Department of Agricultural; Wildlife Management Specialist

Arizona Fish and Game Department

13. DATE OF SUBMISSION: June 30, 1974.

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Tumacacori National Monument, Southern Arizona Group, Western Region.

2. PROJECT NAME AND NUMBER: Vegetation Maintenance (TUMA-RM-2)

3. STATEMENT OF PROBLEM: Control of grasses in the visitor use area is needed for fire hazard reduction and visual restoration. Removal of trees and large woody plants is necessary to preserve and protect the standing and subsurface historic structures.

4. WHAT HAS BEEN DONE: For the past 56 years the park has pursued a program of routine mowing of grass in specified areas; cutting of dying trees to ground level; and sporadic hand pulling of weeds in visitor use areas.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: In areas known to contain subsurface remains and visible historic structures, trees will be removed and stumps chemically treated. Mowing the grass to a height of four or more inches will be accomplished by hand operated machinery to avoid unnecessary soil compaction. In the dry season the remaining areas will be mowed and no trees will be removed unless dead or exotic.

6. LENGTH OF TIME NEEDED: Continuous.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

   a. Root damage to subsurface ruins

   b. Root damage to foundations of visible historic structures

   c. Penetration of PVC sheeting protecting church foundation

   d. Visual interference

   e. Fire hazards

8. WHAT ARE THE ALTERNATIVES:

   a. No action

   b. Use of herbicides and soil sterilants

   c. Mow entire area

   d. Cultivate walled garden as done by the Indians

   e. Restore historical irrigation ditch to working order

9. PERSONNEL: Maintenance staff.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services	1,100				
Other than personal services	100	Est. 10% increase per year			
GRAND TOTAL	1,200				
Funds available in park base	1,200				
Funds requested from Regional Office	0				

On Form Date Submitted

11. MANAGEMENT AND ASSESSMENT NEEDS: None

12. REFERENCES AND CONTACTS:

Ruins Stabilization Unit; Western Archeological Center; Tucson, AZ

13. DATE OF SUBMISSION: June 30, 1974.

NEEDS FOR ASSESSMENT OF CULTURAL RESOURCES EFFECTED BY DEVELOPMENT PROJECTS

Explanation

Assessment: This consists of a review of a proposed development project to determine if it will affect cultural resources. It will determine if field inspection is required to determine effects, what steps are required to mitigate impact on the resources and what steps are necessary to comply with legislation and policies on historic preservation. Assessment will be made with the concurrence of the Regional Office, according to current guidelines for environmental assessment.

Field Inspection and Report: If the project has the potential for disturbance of new ground and if it is not documented by a report of previous field inspection, an on-site inspection or intensive survey by a professional archeologist should be provided. If inspection shows that no cultural remains will be effected, a report by the archeologist can be used to document a determination of no effect, based on an archeological clearance by the Western Archeological Center. Projects that may require inspection are: fence construction, utility lines burial, water-sewer system burial, building construction and trail or road construction. In areas that are known to have cultural resources on or below the surface, it may be necessary to perform professional test excavations to insure that no cultural resources will be disturbed by proposed projects.

E.O. 11593 Report: If the proposed action may result in the transfer, sale, demolition or alternation (adverse effect) of a potential National Register property on land under the control or jurisdiction of the National Park Service, the effects must be reported following the latest procedures of the Advisory Council on Historic Preservation. Determination of effects will require professional assessment and/or field inspection.

Section 106 Report: If a project will affect a National Register property, steps must be taken to comply with Section 106 of the Historic Preservation Act as described in the latest procedures published in the Federal Register by the Advisory Council on Historic Preservation. Determination of effects will require professional assessment and/or field inspection.

Participation in planning, meeting, etc: This activity involves having archeological consultation in master planning, development planning, interpretive planning, etc., to insure that such plans threaten no adverse impacts on cultural resources.

This professional participation also can be applied to reviews of other indirectly related projects, such as flora/fauna studies, water resources studies, etc.

CULTURAL AND NATURAL RESOURCES PROJECTS PROGRAMMING SHEET

TUMACACORI NATIONAL MONUMENT, ARIZONA

FY 1977

Increase or Package No.	Area Priority	Reference No.	Project Title	NPS Costs Expressed in $1000 Yr. 1 (77) BASE*	Yr. 1 (77) NEW**	Yr. 2 (78) BASE	Yr. 2 (78) NEW	Yr. 3 (79) BASE	Yr. 3 (79) NEW	Yr. 4 (80) BASE	Yr. 4 (80) NEW	Yr. 5 (81) BASE	Yr. 5 (81) NEW	Form No. & Date 10-250	10-237	10-238	No. of Contract
122	1	H-1	Mission Church Preservation														
	5	H-2	Agricultural Study		- 2.5										10/76		
	6	H-3	Communications and Trade Study		- 2.5										10/76		
	7	H-4	Social Structure Study		- 2.5										10/76		
	2	N-1	Plant Inventory and Map		- 1.8										6/74		
	3	RM-1	Animal Control		0.6		0.66		0.73		0.80		0.88				
	4	RM-2	Vegetation Maintenance		1.20		1.32		1.45		1.70		1.76				